

AMENDMENTS TO THE CLAIMS

1. (Currently amended) An information processing system, comprising:
 - a first computing device having an intelligent network interface card, the intelligent network interface card configured to:
 - ~~receive an initialization packet originating from a client;~~
 - store ~~information representing a~~ an unattached connection endpoint in a temporary table in response to receiving an initialization packet originating from a client, wherein the unattached connection endpoint contains information associated with the client ~~in a temporary table~~ and the first computing device;
 - ~~output a response packet to the client;~~
 - receive a request packet originating from the client; and based on at least a state of the first computing device and a second computing device, selectively:
 - output a migration packet containing the information ~~representing the connection associated~~ with the client and the first computing device to the second computing device;
 - remove the ~~information representing the~~ unattached connection endpoint ~~with the client~~ from the temporary table in response to an acknowledgement indicating that the second computing device received the migration packet;
 - store information representing ~~[[the]]~~ a connection with the client in a forward table; and
 - output the request packet to the second computing device by adding an encapsulation header to enable the second computing device to send a response packet to the client comprising information indicating the response packet was sent by the first computing device.

2. (Canceled)

3. (Previously presented) The system of Claim 1 wherein the second computing device is configured to perform an operation of a software application in response to receipt of a request packet.

4. (Previously presented) The system of Claim 3 wherein the software application is a socket-based application.

5. (Currently amended) The system of Claim 1 wherein the intelligent network interface card is further configured to receive an initialization packet ~~[[is]]~~ originating from the client, addressed by the client to the first computing device, ~~and wherein the first computing device is configured to receive the initialization packet in response to the addressing.~~

6. (Previously presented) The system of Claim 3 wherein the operation includes outputting a response packet to the client, and wherein the first computing device is configured to selectively output the request packet to the second computing device for outputting the response packet to the client, such that the output response packet bypasses the first computing device.

7. (Currently amended) The system of Claim 1 wherein the intelligent network interface card is further configured to receive an initialization packet ~~is received~~ originating from the client through a network comprising a global computer network.

8. (Previously presented) The system of Claim 7 wherein the migration packet is output through a network comprising a local area network.

9. (Canceled)

10. (Currently amended) The system of Claim 1 wherein the ~~information representing the connection with the client~~ unattached connection endpoint includes a group of sequence numbers associated with the connection.

11. (Currently amended) The system of Claim 10 wherein the first computing device is configured to selectively output a migration packet containing the information ~~representing the connection~~ associated with the client and the first computing device and the group of sequence numbers associated with the connection to the second computing device for performing an operation in response to receiving the migration packet and the request packet, the operation including outputting a response packet to the client according to the group of sequence numbers, such that the output response packet bypasses the first computing device and appears to the client as received from the first computing device.

12. (Original) The system of Claim 10 wherein the group of sequence numbers includes at least one start sequence number, at least one current sequence number, and at least one acknowledgement sequence number.

13. (Currently amended) The system of Claim 1 wherein the ~~information representing a connection with the client~~ unattached connection endpoint includes an address of the first computing device; and

wherein the request packet is output to the second computing device for performing an operation in response to receiving the migration packet and the request packet, the operation including outputting a response packet to the client with a source address that indicates the address of the first computing device, such that the output response packet bypasses the first computing device and appears to the client as received from the first computing device.

14. (Original) The system of Claim 13 wherein the address includes an IP address.
15. (Original) The system of Claim 14 wherein the address includes a port.
16. (Original) The system of Claim 15 wherein the port is a TCP port.
17. (Original) The system of Claim 15 wherein the port is a UDP port.
18. (Currently amended) A method performed by an intelligent network interface controller of a first computing device of an information processing system, the method comprising:
- ~~receiving an initialization packet originating from a client;~~
 - ~~storing a data structure containing information associated with a~~ an unattached connection endpoint in a temporary table in response to receiving an initialization packet originating from a client, wherein the unattached connection endpoint contains information associated with the client and the first computing device;
 - ~~outputting a response packet to the client;~~
 - ~~receiving a request packet originating from the client; and~~
 - ~~based on at least a state of the first computing device and a second computing device, selectively:~~
 - ~~outputting a packet containing the information associated with the connection with the client~~ and the first computing device to the second computing device;
 - ~~receiving an acknowledgement packet indicating that the second computing device received the packet containing the information associated with the connection with the client;~~

removing the unattached connection endpoint from the temporary table in response to receiving an acknowledgement packet indicating that the second computing device received the packet containing the information associated with the client and the first computing device; and

outputting the request packet to the second computing device for performing an operation in response to the request packet by adding an encapsulation header to the request packet; wherein the operation includes outputting a response packet to the client comprising information indicating the response packet was sent from the first computing device.

19. (Canceled)

20. (Original) The method of Claim 18 wherein the operation is part of a software application.

21. (Previously presented) The method of Claim 20 wherein the software application is a socket-based application.

22. (Currently amended) The method of Claim 18, further comprising receiving an ~~wherein the~~ initialization packet originating from the client, wherein the initialization packet is addressed by the client to the first computing device, and wherein the receiving an initialization packet originating from [[a]] the client comprises:

receiving the initialization packet in response to the addressing.

23. (Previously presented) The method of Claim 18, wherein the operation in response to the request packet comprises outputting a response packet to the client that bypasses the first computing device.

24. (Currently amended) The method of Claim 18, further comprising:
receiving ~~[[the]]~~ an initialization packet originating from the client through a global computer network.

25. (Previously presented) The method of Claim 24, further comprising:
selectively outputting the request packet to the second computing device through a local area network.

26. (Currently amended) The method of Claim 18, comprising:
outputting a packet containing the information associated with ~~the connection with the~~ client and the first computing device to the second computing device for associating an application of the second computing device with the connection.

27. (Currently amended) The method of Claim 18, wherein the information associated with ~~the connection with the~~ client and the first computing device includes a group of sequence numbers associated with the connection.

28. (Currently amended) The method of Claim 27, further comprising outputting a packet containing the information associated with ~~the connection with the~~ client and the first computing device to the second computing device for outputting a response packet to the client according to the group of sequence numbers, such that the output response packet bypasses the first computing device.

29. (Original) The method of Claim 27 wherein the group of sequence numbers includes at least one start sequence number, at least one current sequence number, and at least one acknowledgement sequence number.

30. (Currently amended) The method of Claim 18, wherein the packet containing the information associated with the ~~connection with the client~~ and the first computing device includes an address of the first computing device, an address of the second computing device, an address of the client, and a flag indicating the type of packet.

31. (Previously presented) The method of Claim 30 wherein the addresses include an IP address.

32. (Previously presented) The method of Claim 31 wherein the addresses include a port.

33. (Original) The method of Claim 32 wherein the port is a TCP port.

34. (Original) The method of Claim 32 wherein the port is a UDP port.

35. (Currently amended) A first intelligent network interface device, comprising:
a processor that is ~~structured~~ configured to:
maintain a state information table;
~~receive an initialization packet from a client;~~
create an unattached connection endpoint in response to receiving an initialization packet from a client, wherein the unattached connection endpoint contains information associated with the client and the first intelligent network interface device;
~~transmit a response packet to the client;~~
receive an IP request packet from the client associated with the unattached connection endpoint; and
selectively, based at least in part on the state information table:

transmit a packet containing the information associated with the client and the first intelligent network interface device contained within the unattached connection endpoint to a second intelligent network interface device;

delete the unattached connection endpoint in response to receiving an acknowledgement indicating that the second intelligent network interface device received the packet containing the unattached connection endpoint information; and

transmit the request packet to the second intelligent network interface device by adding an encapsulation header, ~~so that~~ to enable the second intelligent network interface device ~~causes to cause~~ a response IP packet to be sent to the client that ~~appears to have been~~ contains information indicating the response IP packet was sent from the first intelligent network interface device ~~to be sent to the client~~.

36. (Previously presented) The first intelligent network interface device of claim 35, further coupled to a synchronization network for receiving synchronization information, wherein the processor is configured to maintain the state information table based at least on part on the received synchronization information.

37-38. (Canceled)

39. (Currently amended) A server farm, comprising:
a plurality of servers, each server comprising ~~a first computing device~~ an intelligent network interface controller;
wherein the ~~first computing device~~ intelligent network interface controller of a first server of the plurality of servers is configured to:
~~receive a SYN packet originating from a client;~~

~~store information associated with a~~ an unattached connection endpoint in response to receiving a SYN packet originating from a client, wherein the unattached connection endpoint contains information associated with the client and the first server;

~~output a SYN/ACK packet to the client;~~

receive a PUSH packet originating from the client; and

selectively, based at least in part on synchronization information transmitted between the plurality of servers:

output a migration packet containing the information associated with the ~~connection with the client and the first server~~ to a first computing device an intelligent network interface controller of a second server;

~~receive~~ delete the stored unattached connection endpoint in response to receiving an acknowledgement packet that indicates that the first computing device of the second server received the packet containing the information associated with the ~~connection with the client and the first server;~~ and

encapsulate and output the PUSH packet to the ~~first computing device~~ intelligent network interface controller of the second server to enable the second server to send a response packet to the client comprising information indicating the response packet was sent from the first server.

40. (Previously presented) The server farm of claim 39, further comprising:

a first router, coupled to the first server and configured to transmit client requests to the first server; and

a second router, coupled to the second server and configured to transmit a response to the client from the second server;

wherein the response to the client transmitted by the second server bypasses the first router.

41. (Previously presented) The server farm of claim 39 wherein each server can receive a client request.

42. (Currently amended) A computer-readable memory medium containing instructions for controlling a computer processor associated with an intelligent network interface controller of a server among a plurality of servers to selectively load balance and direct network requests among the plurality of servers, by:

maintaining a state table associated with the plurality of servers;

~~receiving an initialization packet originating from a client;~~

creating an unattached endpoint in response to receiving an initialization packet originating from a client, and storing information that associates the unattached endpoint with the client and the server in a temporary table;

~~outputting an acknowledgement packet to the client;~~

receiving a request packet generated by the client; and

selectively, based at least in part on the state information table:

outputting a migration packet containing the information that associates the unattached endpoint with the client and the server to a second processor residing in a different one of the plurality of servers;

~~receiving deleting the information that associates the unattached endpoint with the client and the server from the temporary table in response to~~ a packet from the second processor that indicates that the second processor received the migration packet and successfully processed it;

generating a forward packet that encapsulates the request packet; and
outputting the forward packet to the second processor to enable the second processor to output a response packet to the client that contains information indicating the response packet was sent from the server.

43. (Previously presented) The computer-readable memory medium of claim 42, further comprising instructions that control the processor by:

when a forward packet is received, selectively generating a response packet for transmission to the client.

44. (Canceled)

45. (Previously presented) The computer-readable memory medium of claim 42 wherein the forward packet contains an encapsulation header that identifies client connection information.

46. (Currently amended) A server having an intelligent network interface controller for use in a computer system server farm, the intelligent network interface controller comprising:

means for monitoring a state of the server farm;

means for receiving packets from a global network;

~~means for generating a first type of packet and transmitting the first type of packet via the global network when an initialization packet is received from the global network;~~

means for storing ~~a data structure containing information associated with a~~ an unattached connection endpoint in a temporary table in response to receiving an initialization packet from the global network, wherein the unattached connection endpoint contains information associated with the client and the server;

means for selectively generating, based at least in part on the monitored state of the server farm, a ~~second~~ first type of packet containing the information associated with the client and the server when a client request packet is received from the global network;

means for transmitting the ~~second~~ first type of packet to a second server in the server farm, wherein the means for transmitting the ~~second~~ first type of packet bypasses the means for receiving packets from the global network;

means for deleting the unattached connection endpoint from the temporary table in response to receiving a ~~[[third]]~~ second type of packet from the second server;

means for generating a ~~fourth~~ third type of packet that encapsulates the client request packet; and

means for transmitting the ~~fourth~~ third type of packet to the second server to enable the second server to send a response packet to the client that contains information indicating the response packet was sent from the server.

47. (Currently amended) The server of claim 46 wherein the means for receiving packets from a global network comprises a connection to a first local area network and the means for transmitting the ~~second~~ first type of packet, the means for receiving a ~~[[third]]~~ second type of packet, and the means for transmitting the ~~fourth~~ third type of packet comprise a connection to a second local area network that is separate from the first local area network.

48. (Previously presented) The server of claim 47 wherein the means for monitoring the state of the server farm comprises a connection to a synchronization network that is separate from the first local area network.

49. (Currently amended) An information processing system, comprising:
a first computer system; and

a second computer system having ~~[[a]]~~ an intelligent network interface card that is ~~structured~~ configured to:

~~receive an initialization packet created by a client;~~

~~output a response packet to the client to set up a connection over a network;~~

~~store a data structure~~ an unattached connection endpoint in a temporary table in response to receiving an initialization packet created by a client, the unattached connection endpoint containing information that identifies [[the]] a connection with the client and including information associated with the client and the second computer system;

~~receive a request packet originating from the client directed to the connection;~~

~~based on at least a state of at least one of the first computer system and the second computing system, selectively:~~

~~output a packet containing the information that identifies the connection to [[a]]~~ an intelligent network interface card of the first computer system, thereby migrating the connection to the first computer system;

~~receive~~ remove the unattached connection endpoint from the temporary table in response to receiving, from the first computer system, a packet that indicates that the first computer system received the packet containing the information identifying the connection; and

~~output a forwarded-request packet to the network interface card of the first computer system, the forwarded-request packet encapsulating the request packet and including both information identifying the connection and a field in a header of the forwarded-request packet indicating that the forwarded-request packet is a forwarded packet, to enable the first computer system to output a response packet to the client comprising information indicating the response packet was sent from the second computer system.~~

50-51. (Canceled)

52. (Currently amended) The information processing system of claim 49 wherein the intelligent network interface card of the second computer system selectively outputs the forwarded-request packet to ~~[[the]]~~ an intelligent network interface card of the first computer system without using TCP splicing techniques.

53. (Currently amended) The method of claim 30, wherein the information associated with the ~~connection with the client~~ and the first computing device includes an address of the first computing device, an address of the second computing device, an address of the client, and a flag indicating the type of packet, such that the information associated with ~~the connection with the client~~ and the first computing device can be used to create an output response packet that bypasses the first computing device.

54-56. (Canceled)

57. (Currently amended) A method of servicing client requests performed by an intelligent network interface controller, the method comprising:

receiving a client request packet;

selectively redistributing the received client request packet;

transmitting synchronization information; and

selectively migrating a client connection based at least in part on the transmitted synchronization information;

wherein the received client request packet is selectively redistributed and the client connection is selectively migrated by:

storing an unattached connection endpoint in a temporary table, wherein the unattached connection endpoint contains information associated with a connection with the client;

outputting a packet containing a copy of the information associated with the connection with the client;

removing the unattached connection endpoint from the temporary table in response to receiving an acknowledgement that indicates that the packet containing a copy of the information associated with the connection with the client was received;

encapsulating the client request packet; and

transmitting the encapsulated client request packet to enable a computing device to send a response packet to the client that contains information indicating the response packet was sent from the intelligent network interface controller.

58. (Previously presented) The method of claim 57, further comprising:
maintaining a state information table based at least in part on the transmitted synchronization information.

59. (Previously presented) The method of claim 57 wherein the selectively redistributing is based at least in part on the transmitted synchronization information.

60. (Previously presented) The method of claim 57 further comprising performing an operation in response to the request packet.

61. (Previously presented) The method of Claim 60 wherein the operation is part of a socket-based software application.

62. (Previously presented) The method of Claim 57 wherein the client request packet is received through a first network comprising a global computer network.

63. (Previously presented) The method of Claim 62 wherein the received client request packet is redistributed through a second network comprising a local area network.

64-65. (Canceled)

66. (Previously presented) The method of Claim 57 wherein the data structure includes a group of sequence numbers associated with the connection.

67. (Previously presented) The method of Claim 66, further comprising:
outputting a response packet to the client according to the group of sequence numbers.

68. (New) An information processing system, comprising:
a first computing device configured to:

store information representing a connection with a client in a temporary table in response to receiving an initialization packet originating from the client, the information including a group of sequence numbers associated with the connection;

receive a request packet originating from the client; and based on at least a state of the first computing device and a second computing device, selectively:

output a migration packet containing the information representing the connection with the client to the second computing device for performing an operation in response to receiving the migration packet and the request packet, the operation including outputting a response packet to the client according to the group of sequence numbers, such that the output response packet bypasses the first computing device and appears to the client as received from the first computing device;

remove the information representing the connection with the client from the temporary table in response to an acknowledgement indicating that the second computing device received the migration packet;

store information representing the connection with the client in a forward table; and

output the request packet to the second computing device.

69. (New) The system of Claim 1, wherein the intelligent network interface card is further configured to output an initialization response packet to the client.

70. (New) The method of Claim 18, further comprising outputting an initialization response packet to the client.

71. (New) The method of Claim 35, wherein the processor is further configured to receive an initialization packet from the client, and to transmit an initialization response packet to the client.

72. (New) The server farm of Claim 39, wherein the intelligent network interface controller of the first server of the plurality of servers is further configured to:

receive a SYN packet originating from the client; and

output a SYN/ACK packet to the client.

73. (New) The computer-readable memory medium of Claim 42, containing further instructions for controlling a computer processor associated with an intelligent network interface controller of a server among a plurality of servers to selectively load balance and direct network requests among the plurality of servers, by:

receiving an initialization packet originating from the client; and

outputting an acknowledgment packet to the client.

74. (New) The server of Claim 46, the intelligent network interface controller further comprising means for generating an acknowledgement packet and transmitting the acknowledgement packet via the global network when an initialization packet is received from the global network.

75. (New) The system of Claim 49, wherein the intelligent network interface card of the second computer system is further configured to:

receive an initialization packet created by a client; and

output an initialization response packet to the client to set up the connection over a network.